

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No. : 10/529,534)
Confirmation : 4559)
Applicants : LEGGE et al.)
Filed : March 29, 2005)
Title: GEOTECHNICAL BARRIER)
Art Unit : 3673)
Examiner : KRECK, John J.)
Atty Docket : 28206/41081)
Customer No. : 04743)
)
)

DECLARATION OF KELVIN ROBERT LEGGE UNDER 37 C.F.R. § 1.132

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, Kelvin Robert Legge, hereby declare the following:

1. I am an original, joint inventor of the subject matter disclosed and claimed in the above-identified application.
2.
 - a. I graduated in 1982 with a B.Sc (Civil Engineering) degree from the University of the Witwatersrand in Johannesburg, South Africa. Thereafter, I completed seven post-graduate courses in geotechnical and hydraulic engineering in 1985 and 1986.
 - b. In 1982, I joined the South African Department of Water Affairs and Forestry working in the Materials Laboratory in Pretoria West. Tasks included concrete mix and special purpose grout design, and soils investigations for dams, with the primary responsibility of investigating the suitability of geotextile synthetic filters for use in embankment dams.



In 1986, I was transferred to the Sub-Directorate: Earth and Rockfill Dams, where I was responsible for numerous water resource infrastructure conceptual designs and cost comparisons, as well as detailed designs of water supply scheme and flood protection works. Projects included river abstraction; canals; balancing dam and pipeline components of the Lower Fish River Government Water Scheme, the Mlazi Canal lining repairs and new sea outfall; and dams in the Eastern and Western Cape, Northern and North West Provinces of the Republic of South Africa. In 1993, I was promoted to Chief Engineer: Environment Studies and gained experience and was responsible for impact assessment and mitigation, project implementation and auditing. I was personally responsible for the development and implementation of social mitigation measures at Qedusizi Flood Attenuation Dam on the Klip River in KwaZulu – Natal, and for introducing the concept of a ground-water component of the reserve, as defined in the National Water Act, Act 36 of 1998.

From February 1997 to January 2000, I was Acting Director: Design Services and from February 1998, the Acting Director: Social and Ecological Services, transforming the unit into a directorate and aligning strategies for implementing parts of the National Water Act.

In February 2000, I transferred to the Directorate: Civil Design as Senior Specialist Engineer and I am responsible for the implementation of environmental management. I am currently responsible for integrated environmental engineering of the Olifants River Water Resource Development Project: (Phase 2A) (De Hoop Dam) and for the National Dam Safety and Rehabilitation Program.

As a specialist on geosynthetics and liquid migration in soils, Kelvin's additional duties in the later years have included evaluation of the safety and acceptability of landfill designs (primarily for hazardous waste) and parts of dam failure investigations such as Zoeknag and Tweede Dams.

c. I have served on the following professional boards and committees:

- SA Institute of Civil Engineers: Geotechnical Division (1985 – 1988);



- SA Institute of Engineering Geologists (1986);
 - Standards South Africa technical committees on Polyolefin Sheeting (1526) and on Geotextiles (No 0221), including revisions;
 - International Society for Soil Mechanics and Foundation Engineers (ISSMFE) Technical Committees 3 & 9 on filters and geotextiles respectively, as South African representative;
 - International Geosynthetics Society as SA representative, (1986 – 1990 and 1999 – 2002);
 - Institute of Waste Management (Gauteng) (1995 – 1996);
 - Geosynthetics Interest Group of Southern Africa (1996 to date, including four years as President between 1999 and 2000);
 - Technical paper selection panels of the International Geosynthetics Conferences #4 (Singapore 1994) and #8 (Japan 2006);
 - Editorial board member of Geosynthetics International (2006 to present).
- d. I have published in professional papers, both locally and internationally on subjects including filters, geosynthetics, dispersive soils, waste management and environmental management. A non-exhaustive list of publications includes:
- 2002: Davies PL and Legge KR, Use and Abuse of Geosynthetic clay liners in South Africa, Proceedings Clay Geosynthetic Barriers; Nuremberg; Germany; 16-17 April 2002 ISBN 90509380 8.
 - 2003: Davies PL and Legge KR; Geosynthetic Clay Liners: Use and Abuse in South Africa; Proceedings International Waste Management and Landfill Symposium; Sardinia, Italy; 6-10 October 2003.
 - 2004: Legge KR: Geotextile Selection for Filters within Embankment and Tailings Dams; Proceedings 4th International Conference on Filters and Drainage in Geotechnical and Environmental Engineering; Stellenbosch, South Africa; 19-21 October 2004.
 - 2005: Legge KR; Hydrating the Clay Component of Composite Liners and Enhancing Barrier Performance; Proceedings of Land Filling in Challenging Environments Seminar, Kwa-Zulu Natal, South Africa; 19-20 October 2005. (Copy enclosed)
 - 2006: Legge KR; Improving Performance of Containment Barrier Systems; Proceedings of the 8th International Conference on



3. I am familiar with the above-identified patent application, including the claims of the invention currently pending.
4. I submit this Declaration for the purpose of providing evidence of the unexpected results obtained by practice of the claimed invention.
5. In experiments conducted since filing of the presently pending application, results of which were published in the attached papers, it was found that the displacement of a fluid through a passageway in a geosynthetic barrier had beneficial results both in the hydration of clay liners and the reduction of the temperatures of the primary and secondary geosynthetic liners. Both the level of hydration and the extent of the reduction in temperatures were unexpected. The *in situ* hydration of a clay liner after construction of a double liner had not been demonstrated prior to these experiments and nor had the possibility of hydrating the clay liner by means of a gaseous fluid been considered or demonstrated. Further, although the deleterious effects of increased temperature on the life span and performance of geosynthetic liners was becoming more and more apparent, no solutions to this problem had been proposed or demonstrated, notwithstanding that the consequence of such degradation were and are understood to be potentially disastrous in economic and environmental terms. Nothing in the prior art suggested or lead towards a solution to these problems. The applicant's experiments are the first demonstrations of a method for long term *in situ* hydration of geosynthetic barriers and the control of the temperature rise in such barriers as a result of ambient climatic conditions and spontaneous biological or chemical reactions within materials stored in waste dumps and lagoons contained by such barriers.
6. All statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and such willful false statements may jeopardize the validity of the application or patent issued thereon.



25 May 2007
Date



KELVIN ROBERT LEGGE